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MANIPAL UNIVERSITY



II SEMESTER M. TECH. (CHEMICAL ENGINEERING) END SEM EXAMS - MAY 2016

SUBJECT: AIR POLLUTION MONITORING AND CONTROL (CHE 522)

Time: 3 HOURS

Max.Marks: 100

Note: Answer **ANY FIVE FULL** questions Each question carries 20 Marks

1A	Explain the different background information needed while selecting an air	10
	pollution monitoring site?	
1 B	Explain wind direction and wind speed measurement with a diagram	5
1C	Explain adiabatic lapse rate and radiation inversion	5

2	List any five major air pollutants, their corresponding National ambient air	20
	quality (NAAQ) limits in residential areas, their sources and health effects	
	on human beings and list two methods of measurement each.	1

3 A	Derive the expression for fixed box model of air pollution. List the	10
	assumptions and drawbacks.	
3B	A city is located near an airport. The smelter stack is 300 m high and has a	
	plume rise of 100m. It is emitting 5000 g/s of SO ₂ . Assume stability class is	
	C (Refer chart in next page) and that wind speed is 3 m/s.	
	A flight path for airport is perpendicular to the plume and 5km downwind of	
	the smelter. The airport safety office has determined that it is unsafe for	
	planes if the planes if the plume concentration > 500 μ g/m3. They have also	
	decided that it is unsafe to fly under the plume. What is the minimum	10
	altitude the plane can fly safely above the plume? Assume Gaussian plume	
	and neglect ground reflection of plume.	

4 A	Describe SO ₂ measurement by i) Improved West and Geake method and	10
	ii) UV Fluorescence method	
4B	With a neat diagram explain forced oxidation limestone wet scrubber for	10
	removal of SO_2 from flue gases.	

5A	Draw a neat chart of temperature dependence of NOx formation and explain	10
	thermal NOx, fuel NOx and prompt NOx.	
5B	Explain briefly combustion modification for control of NOx	10

6A	Derive the expression for displacement losses for VOCs.	10
	Estimate the volume of gasoline vapor emitted as displacement losses per	
	cubic meter of gasoline when gasoline is transferred from petrol station	
	storage tanks to the gasoline tanks of the customers' vehicles at 25°C. The	
	vapor pressure of gasoline is 6 psia and the molecular weight is 60 g/mol. (1	
	atm = 14.7 psia). Density of gasoline is 750 kg/m ³ . What volume % of	
	gasoline is lost?	
6B	Write a short notes on latest technologies for air pollution monitoring and	10
	control	



Dispersion coefficients for various stability criteria